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Research Article

CONTRIBUTION OF ALGAL FLORA IN KODAIKANAL LAKE, DINDIGUL DISTRICT, TAMILNADU

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ABSTRACT
The paper deals with the contribution of algal flora in Kodaikanal Lake. The healthy ecological conditions of fresh water bodies depend on the growth of algae. The following groups of phytoplankton were recorded and whose ecology discussed individually are Chlorophyceae, Cyanophyceae, Bacillariophyceae, Dinophyceae, Euglenophyceae and Chysophyceae. In the present study, a total of 59 genera 115 species were recorded in the experimental station kodai lake during the year 2008 to 2009, comprising 25 genera with 54 species of green algae, 16 genus with 33 species of diatoms, 10 genus with 18 species of blue greens, 4 genus with 6 species of euglenophytes, 3 genus with 3 species of dinophytes and, 1 genus with one species of chrysophytes were identified. During the study period the lake was reported with 36.39% of chlorophycean members. The bacillariophycean and cyanophycean members were observed with 25.87 % and 22.47 % respectively. The remaining minor groups' dinophyceae, euglenophyceae and chrysophyceae were found with 5.93, 7.26 and 2.08% respectively (Figure 1).

Key Words: *Algae, Flora, Kodaikanal*

INTRODUCTION
Algae are simplest plants inhabiting almost all kinds of habitats. Majority of them inhabit water bodies and some of them are sensitive to pollution (Palmer, 1980). Phytoplankton is the primary producers forming the first tropic level in the food chain. Lakes, rivers, streams and ponds are enriched with these algal floras. The qualitative and quantitative studies on phytoplankton have been utilized to assess the quality of water (Shekhar *et al.,* 2008). Benthic algal forms can be useful as indicates of water quality (Tiwary and Chauhan, 2006) Phytoplankton diversity responds rapidly to changes in the aquatic environment particularly in relation to nutrients (Chellappa *et al.,* 2008). The algal diversity and occurrence of specific taxa in a water body varies considerably based on the change in physico-chemical parameters like pH, Conductivity, BOD, COD, DO, Salinity and Alkanity (Tiwari *et al.,* 2001). Recently several surveys reported that the researchers have little knowledge about the algal flora of high altitude regions. Kodaikanal Lake, also known as Kodai Lake is one among that, a man-made lake located in the Kodaikanal town. Kodaikanal Lake is on the Palani hills at an attitude of 2100 meters at $10^0$14' latitude and $77^0$28' longitude. The area of the lake is about 65 acres, with the maximum depth of 16 meters. The perimeter of the lake is about 4.80 Kms. The catchments area is 1280.50 ha. So the present work has been carried to understand the contribution of algal flora of Kodai Lake in Kodaikanal. Joseph (2012), Prakash (2011), Jemi (2012), Dabgar, (2012) studied the algal flora of different part of India.

MATERIALS AND METHODS
Phytoplankton Collection
Water samples were collected monthly from Kodaikanal Lake for a period of one year from October 2008 to September 2009. The collections were made early in the morning by using a standard plankton net (No.25) with 30 cm mouth diameter and length of 1 m. 100 liter of surface water was filtered and the filtrate was collected in a clean labeled plastic container. The volume of the concentrate was adjusted to 25 ml and it was preserved immediately with 4% formalin for further analysis. Standard literatures were used for identifying the phytoplankton (Fritsch 1935; Prescott, 1978; Anand, 1998; Krishnamurthy, 2000.

RESULTS

Class: Chlorophyta

Order: Volvocales

1. *Gloeocystis amla* (Kutz.)
2. *Gloeocystis gigas* (Kutz.)

Order: Chlorococcales

3. *Ankistrodesmus convolutes* Corda.
4. *Ankistrodesmus falcatus var. acicularis* (Corda.)
5. *Ankistrodesmus falcatus var. spirilliformis* Lemm.
6. *Chlorella vulgaris* Bayernick
7. *Chlorococcum humicola* (Nag.) Raban.
8. *Coelastrum indicum* Turner
9. *Coelastrum intermedium* Bohlin G.S.West
10. *Crucigenia quadrata* Morren
11. *Crucigenia tetrapedia* (Kirchner)
12. *Dictyosphaerium ehrenbergianum* wood
13. *Golenkinia radiata* (Chod.) Wille
14. *Pediastrum duplex* Lagerheim.
15. *Pediastrum tetras* (Ehr.) Ralfs
16. *Pediastrum angulosum* (Ehr.) Menegh.
17. *Pediastrum angulosum var. laevigatum* Raciborski.
18. *Pediastrum integrum* Nageli
19. *Scenedesmus arcutes var. platydisca* Lemmermann.
20. *Scenedesmus armatus var. bicaudatus* Smith
21. *Scenedesmus bijugatus var. alternans* Kuetz.
22. *Scenedesmus bijugatus var. irregularis* Wille.
23 *Scenedesmus dimorphus var. tortus* G.M.Smith.
24. *Scenedesmus quadricauda var .quadrispinia* Brb
25. *Selenastrum gracili* Reinsch
26. *Tetraedron gracile* (Rein.) Hansgirg
27. *Tetraedron limneticum* Borge
28. *Tetraedron proteiforme* (Turner) Brunnthaler

Order: Ulotrichales

29. *Ulothrix zonata* (Kuetz)
30. *Uronema gigas* vischer.

Order: Oedogoniales

31 *Oedogonium hispidum Nordstedt*
32. Oedogonium spheroideum Nordstedt

Order: Zygnematales

33. *Closterium acerosum* (Schrank.) Ehr.
34. *Closterium ehrenbergii* (Menegh.) ex Ralfs.
35. *Closterium kutzingii* (Kuetz.) Brebission
36. *Closterium venus var.incurvum* (Breb.)
37. *Cosmarium berryense* Kouwets.
38. *Cosmarium turgidum* Ralfs
39. *Desmidium swartzii* Ralfs ex C. Agardh
40. *Micrastearias mahabuleshwarensis* Hobs
41. *Micrastearis incise* (Breb.) Ralfs
42. *Micrastearis apiculata* (Ehrenb.) Menegh

43. *Mougeotia elegantula* Wolle.
44. *Netrium digitus* (Ehrenberg) Roth.
45. *Netrium interruptum* Ehrenberg
46. *Pleurotaenium coronatum* Rabenh.
47. *Pleurotaenium ehrenbergii* (Breb.) De Bary
48. *Pleurotaenium ovatum* Nordst.
49. *Staurstrum recurvatum* Turner
50. *Spirogyra gratiana* Transeau
51. *Spirogyra parvispora* Wood.
52. *Spirogyra subsalsa* Kuetzing
53. *Zygnema collinsianum* Transeau
54. *Zygnema kashmirense* Misra.

Class: CYANOPHYTA

Order: Chroococcales

55. *Aphanocapsa saxicola* Nag.
56. *Chroococcus indicus* Zeller.
57. *Chroococcus minor* (Kutz) Nag.
58. *Chroococcus giganteus* (Smith).
59. *Chroococcus limneticus* Lemm.
60. *Gloeocapsa nigrescens* Naeg.
61. *Microcystis aeroginosa* Kutz
62. *Microcystis incerta* Kutz
63. *Merismopedia elegans* Lemm
64. *Merismopedia glauca* (Her.) Nag.

Order: Oscillatoriales

65. *Lyngbya ceylanica* Wille.
66. *Oscillatoria limosa* Kuetz. ex.Gomont
67. *Oscillatoria princeps* Vaucher ex. Gomont
68. *Oscillatoria sancta* (Kuetz.) Gomont
69. *Spirulina princeps* (Kuetz.) Gomont

Order: Rivulariales

70. *Gloeotrichia raciborskii* Thuret ex. Born.

Order: Nostocales

71. *Anabaena crassa* Lemmermann
72. *Anabaena planctonica* Brunnthaler

Class: BACILLARIOPHYTA

Order: Centrales

73. *Cyclotella meneghiniana* Kuetz

Order: Pennales

74. *Amphora ovalis* Kuetz.
75. *Amphora veneta* Kuetz.
76. *Cymbella turgid* Kuetz.
77. *Cymbella lanceolata* (Breb.)
78. *Caloneis bacillaris* (Greg.).
79. *Denticula elegans* Kuetz.
80. *Diatoma vulgaris* Bory de Saint.
81. *Eunotia bilunaris* (Ehr.) Grun.
82. *Eunotia camelus* (Kuetz.) Rabenh.
83. *Fragilaria capucina* Desmazieres.

84. *Fragilaria crotonensis* Kitton.
85. *Fragilaria intermedia* (Grun.)
86. *Gyrosigma acuminatum* (Rubh.) Clave.
87. *Gomphonema acuminatum* Ehr.
88. *Gomphonema lanceolatum* Ehr.
89. *Gomphonema trungatum* Ehr.
90. *Navicula cuspidata* Kuetz.
91. *Navicula radiosa* Kuetz.
92. *Navicula halophila* Kuetz.
93. *Navicula rhomboidea* Kuetz.
94. *Navicula viridula* Kuetz.
95. *Nitzschia amphibian* (Grun.).
96. *Nitzschia acic*ularis Smith
97. *Nitzchia obtuse* Smith
98. *Nitzchia palea* (Kuetz.) Smith.
99. *Pinnularia viridis* (Nitzsch) Ehr.
100. *Pinnularia simplex* Ehr.
101. *Synedra delicatissima* (Nitzsch.) Ehr.
102. *Synedra ulna* (Nitzsch.) Ehr.
103. *Suriella elegans* Ehr
104. *Tabellaria fenestrata* (Lyngh) Kuetz
105. *Tabellaria flocculosa* (Roth.) Kutz.

Class: EUGLENOPHYTA

Order: Euglenales

106. *Euglena obtuse-caudata* Kisselew
107. *Euglena sanguine* Ehrenberg
108. *Lepocinclis salina* (Ehrenberg)
109. *Phacus cylindricus* Pochmann
110. *Trachelomonas volvocina* Ehr.
111. *Trachelomonas volvocina var. subglobosa* (Ehr.)

Class: DINOPHYTA

112. *Ceratium hirudinella* (Mull.) Dujardin.
113. *Gymnodinium caudatum* Prescott
114. *Peridinium willei* Huitfeldt.

Class: CHRYSOPHYTA

115. *Dinobryon divergens* O.E. Imhof

DISCUSSION

Chlorophyta or green algae form the ancient and cosmopolitan algae including 425 genera and 6500 species (Sharma, 1996). In the present investigation, a total of 115 species of phytoplankton were observed. Out of these 25 genera 54 species were recorded under chlorophyta in five orders (Volvocales, Chlorococcales, Zygnematales, Ulotricales and Oedogoniales). Previous studies on different lakes highlighted the species composition of chlorophyta Iqbal *et al.* (2008) observed 131 species of which 63 species belonged to chlorophyta. Kiran *et al.* (2005) collected a total of 34 species from Ayyanakare taluk of Karnataka, in which 17 species belonged to chlorophyta, Jemi (2012) reported 225 species out of that 85 belonged to chlorophyta. In the present study the percentage contribution of chlorophyte (Figure 1) was maximum (36.39%) in kodai lake. Such higher percentage of chlorophycean members were reported from the studies on lake by Indabawa (2009) in Nguru lake, Verma *et al*. (2011) in Kankaria lake. Among the five orders the order chlorococcales occupied the top most position representing 11 genera 26 species.

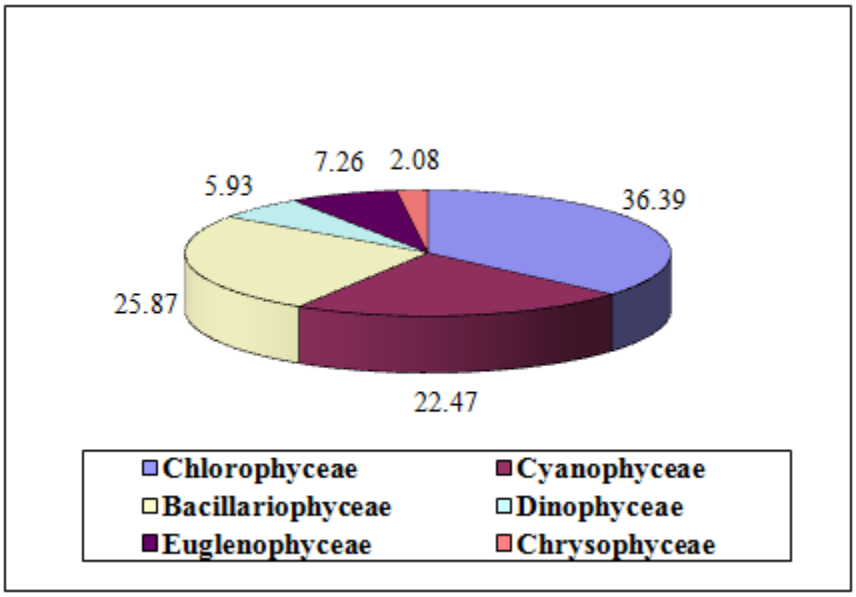

Figure 1: Percentage contribution of phytoplankton in Kodai Lake during the study period Oct 2008 – 2009

The order of occurrence was Chlorococcales > Zygnematales > Ulotricales > Volvocales > Oedogoniales. Several researchers reported maximum number of phytoplankton species under the order chlorococcales (Sudeep *et al.*, 2008)). Bacillariophyta was recorded with 16 genera 33 species under the order centrals and pennales. Murugesan and Sivasubramanian, 2008, reported 21 genera with 42 species from Porur Lake, Chennai and Padhi *et al.*, (2010) collected 21 genuses with 22 species from the lake at Maharashtra. The percentage contributions of the bacillariophycean (Figure 1) members were more (25.87%). Similar observations were reported from the findings of Ganai *et al.*, (2010) in Walur Lake. A total of 10 genera 18 species were collected under Cyanophyta during the study period. Similar observations were made from the studies of Gomathi *et al.* (2011) who reported 10 genera 36 species of Cyanobacteria. The species were found fewer than four orders as Chroococcales, Oscillatoriales, Nostocales and Rivulariales. The genus Chroococcus was noticed with 4 species and Oscillatoria with 3 species. Lashari *et al.*, (2009) reported the genus *Oscillatoria*, *Microcystis* and *Chroococcus* abundantly. Cyanophyta occupied third position with a maximum of 22.47 % (Figure 1). In several fresh water environments lesser percentage contribution was observed (Gehlot and Barupal, 2010). The class euglenophyta was noticed with 6 species which corroborate with the reports of Jasprica *et al.*, (2006) who found 4 species of *Euglena*. The percentage contribution of euglenophyceae was less and reached maximum of 7.4 %. Such poor contribution of euglenophytes was reported by Tavares *et al.*, (2011) in fresh water lakes. The class dinophyta was represented with *Gymnodinium*, *Peridinium* and *Ceratium* and are previously reported by several researchers in freshwater lakes, *Gymnodinium* and *Ceratium* species were reported by Zaware and Pingle (2003) from Pashan lake and Jemi (2012) in the temple ponds of kanyakumari district.Chrysophyceae was distributed with a single species (Dinobryon divergens). Similar contribution was shown by Zawari and Pingle (2003) and Bwala *et al.*, (2010) in various fresh water bodies.

In general plankton biomass and composition in shallow water bodies fluctuate as a reaction to several interacting driving forces which may include polymixis, water level changes, weather conditions, nutrient loading and feeding management (Borics *et al.*, 2000). In the present investigation, it is revealed that, Kodai Lake is enriched with different groups of algal flora especially chlorophyta.

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